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10/786,900	02/24/2004	Wei-Feng Huang	004320.P075	4403

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EXAMINER	
YEH, EUENG NAN	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/786,900	HUANG, WEI-FENG	
	Examiner	Art Unit	
	Eueng-nan Yeh	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-70 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-70 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on Feb 24, 2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to because of following minor informalities:

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "416" and "418" in Figure 4 have both been used to designate "B".

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities and appropriate corrections are required: Page 11, last line "G component from its closest

previous pixel". The "G" appears to be a mistake. According to figure 4 the appropriate component is "R".

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-14, 16, 36-49, and 51 are rejected under 35 U.S.C. 102(e) as being anticipated by Yeo et al. (US 6,738,509 B2).

Regarding claims 1 and 36, Yeo discloses a method for processing images ("Multi-spectral images can be described in any one of a plurality of known spectral or color spaces" at column 1, line 21), the method comprising:

act A: converting a first image data from a first color space into a second image data that corresponds to a second color space (as depicted in figure 9 , numeral 902 to perform color space 1 to 2 transform);

act B: perform image processing on the second image data in the second color space to form a processed image data (as depicted in figure 9, numerals 904 and 906 to perform data compression process); and

act C: converting the processed image data to a third image data that corresponds to first color spaces (as depicted in figure 9, numeral 908 to perform color space 2 to 1 transform.)

Regarding claims 2 and 37, the first color space is a single color component color space (as depicted in figure 9, color space 1 components (A and B) are input into a color space 1 to color space 2 transformer 902 where components A and B are part of the multi-spectral image; "Multi-spectral images can be described in any one of a plurality of known spectral or color spaces" at column 1, line 21. Thus, the first color space can be a single color component color space).

Regarding claims 3-4, and 38-39, the first color space is a multiple color component color space ("color space 1 may be any color space, such as RGB color space, for example" at column 4, line 9).

Regarding claims 5 and 40, the second color space is a single color component color space (discussed in claim 2, "Multi-spectral images can be described in any one of a plurality of known spectral or color spaces" at column 1, line 21. Thus, the second color space can be a single color component color space.)

Regarding claims 6-7, and 41-42, the second color space is a multiple color component color space ("... color space 2 may be YCbCr color space. Other color space combination are also possible ..." at column 4, line 49).

Regarding claims 8 and 43, the third color space is a single color component color space (discussed in claim 2, "Multi-spectral images can be described in any one of a plurality of known spectral or color spaces" at column 1, line 21. Thus, the third color space can be a single color component color space.)

Regarding claims 9-10, and 44-45, the third color space is a multiple color component color space (according to act C the third color space is color space 1; "color space 1 may be any color space, such as RGB color space, for example" at column 4, line 9).

Regarding claims 11 and 46, act A further comprises using one or more temporary buffers to store the second image data ("... a system unit having a central processing unit (CPU) and associated volatile and non-volatile memory, including all RAM ...CD-ROM drive ..." at column 10, line 42).

Regarding claims 12 and 47, act B further comprises using one or more temporary buffers to store the processed image data (discussed in claims 11 and 46).

Regarding claims 13 and 48, act B further comprises image data compression (as depicted in figure 9 for data compression process).

Regarding claims 16 and 51, act A further comprises applying a conversion equation to each pixel, wherein the conversion equation is selected based on the second color space (as depicted in figure 4, numeral 402 shows the color space conversion equations).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 14-15, 17-28, 49-50, and 52-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Yeo and Rashkovskiy et al. (U.S. 6,252,577 B1).

Regarding claims 14, 28, 49, and 63, Yeo discloses color space transformation from 1 to 2. Yeo does not explicitly disclose the color space interpolation.

Rashkovskiy, in the same field of endeavor of "digital image processing" at column 1, line 5, discloses the details of interpolation from a single color component to a multiple color component: "each pixel in the original image is converted from having a single color component into one pixel having multiple color components ... by

interpolating the additional color components of a pixel based on the intensities and colors of its neighboring pixels ..." at column 1, line 37). Regarding claims 28 and 63, the interpolation is based on nearest neighbor interpolation.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide the color space transformation methodology Yeo made with single/multiple color interpolation as taught by Rashkovskiy, in order to explicitly illustrate the interpolation processing steps.

Regarding claims 15 and 50, applying a conversion equation to each interpolated pixel, wherein the conversion equation is selected based on the second color space (as depicted in Yeo figure 4, numeral 402 shows the color space conversion equations. See also Rashkovskiy column 1, line 44 "a conversion is performed upon the multiple component pixels from the color space of the image sensor to a color space that is more suitable for mathematical processing").

Regarding claims 17 and 52, color interpolation further comprises deriving missing color components for each pixel from the pixel's neighboring pixels, wherein the neighboring pixels contain the missing color components ("missing components are then determined by applying an interpolation methodology" at Rashkovskiy column 2, line 21; "interpolation the additional color components of a pixel based on the intensities and colors of its neighboring pixels" at Rashkovskiy column 1, line 42).

Regarding claims 18-20 and 53-55, deriving missing color components for each pixel from the pixel's neighboring pixels (as described in Rashkovskiy Equation-1 at column 5, the products are then summed or averaged to yield a component of the target pixel. A 3X7 target area, as shown at column 4, is for illustration purpose. "the operator may take on a larger or smaller size. In addition, the array need not have an odd number of coefficients on each side ..." at column 5, line 1. The coefficient cg(i, j) in Equation-1 is the normalized weighting factor shown by Equation-2.

In order to derive missing color components for each pixel from the pixel's closest previous and next pixels in a horizontal direction, Equations-1 and 2 can apply to a 1X3 target area e.g. G(9) B(10) G(11). Thus, G at position 10, i.e. G(10), can be the averaging of closest previous pixel G(9) and next pixel G(11) in the horizontal direction when weighting factor is 0.5. Otherwise, G(10) can be estimated by appropriate weighting factors.)

Regarding claims 21-22 and 56-57, act S further comprises averaging pixels corresponding to each missing color component from the previous line of pixels (With proper selection of the size of target area, Equations-1 and 2 can be used to derive averaged or weighted pixel values corresponding to each missing color component from the previous line of pixels).

Regarding claims 23 and 58, the fixed number is based on missing color components from previous frames ("... missing components, however, may now be

readily computed using conventional interpolation techniques as will be apparent to those of ordinary skill in the art ..." Rashkovskiy at column 4, line 1. Thus, the fixed number is based on missing color components from previous frames is one acceptable alternative method.)

Regarding claims 24 and 59, low-pass filters used ("next step is to determine the filtering that will be applied to the selected region to generate the G component of the target pixel in the scaled image ... Equation-3 ..." Rashkovskiy at column 6, line 13. "Any one of a number of different filters can be used for h(j), but the well known Hamming filter works particularly well ..." Rashkovskiy at column 6, line 64. Where Hamming filter is a low pass filter.)

Regarding claims 25-27 and 60-62, using filters before, after, before and after performing the color interpolation (as discussed in claims 24 and 59, performing filter after interpolation. However, Equations-4 and 5 of Rashkovskiy at column 6, do filter before interpolation. Without departing from the essence of Rashkovskiy's invention, filters can apply before and after performing the color interpolation.)

7. Claims 29-32 and 64-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Yeo and Acharya (US 2002/0101524 A1).

Regarding claims 29 and 64, Yeo discloses color space transformation from 2 to 1. Yeo does not explicitly disclose the details of color space re-mapping process.

Acharya, in the same field of endeavor of image processing ("the invention relates to the field of digital imaging systems and software" in paragraph 4, line 2), discloses a known technique to process 8-bit Bayer data to 24-bit RGB then to 24-bit YCrCb and re-map to 12-bit YCrCb as depicted in figure 1, also his invention of single pass from 8-bit Bayer data to 12-bit YCrCb in figure 4.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide the color space transformation methodology Yeo made with the mapping technique as taught by Acharya, in order not only to explicitly illustrate the color transform processing but also to "image memory size can all be reduced" in Acharya paragraph 14, line 11.

Regarding claims 30 and 65, act C further comprises applying a conversion equation to each pixel of the processed image data, wherein the conversion equation is selected based on a selected color space from the set of color spaces (as depicted in Yeo figure 5, numeral 502 shows the color space conversion equations).

Regarding claims 31 and 66, after applying the conversion equation, re-mapping each pixel of the processed image data into the selected color space (as discussed in claims 30 and 65 conversion equation applies to each pixel; claims 29 and 64 to re-map each pixel of the processed image data into the selected color space).

Regarding claims 32 and 67, re-mapping includes dropping undesired color components (as depicted in Acharya figure 1C and figure 4, the undesired color components of Cb and Cr are dropped so the file size can be reduced).

8. Claims 33-35 and 68-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Yeo and Acharya as applied to claims 29-32 and 64-67 discussed above and further in view of Rashkovskiy et al.

The Yeo and Acharya combination teaches color conversion and re-map. The Yeo and Acharya combination does not teach the details of filtering process.

Rashkovskiy, in the same field of endeavor of "digital image processing" at column 1, line 5, discloses "the well known Hamming filter works particularly well and is relatively simple to implement" at column 6, line 66. As discussed in claims 25-27 and 60-62 this filter can be applied before, after, and before and after color interpolation. Without departing from the scope and spirit of Rashkovskiy's methodology, this filter can also be applied before, after, and before and after dropping undesired color components.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide the color space transformation methodology Yeo and Acharya combination with filtering technique as taught by Rashkovskiy, in order not only to explicitly illustrate the color transform processing but also to avoid "any aliasing effects" at Rashkovskiy column 7, line 31.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Tsai et al. (US 6,275,206 B1): converting color images for liquid crystal display.

James E. Adams, Jr. (SPIE, July 1995, Vol. 2416, 144-151): pixel averaging technique to recover missing color components.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eueng-nan Yeh whose telephone number is 571-270-1586. The examiner can normally be reached on Monday-Friday 8AM-4:30PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on 571-272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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